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FINAL REPORT ON AFOSR-87-0124

"ANALYTICAL, NUMERICAL AND EXPERIMENTAL  
INVESTIGATIONS OF OBLIQUE-SHOCK-WAVE  
REFLECTIONS IN PURE AND DUSTY GASES"

1 February, 1987 - 30 September, 1988

by

Dr. I. I. Glass, Principal Investigator

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OCTOBER 1988

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SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE			Available for public release; distribution unlimited.		
4. PERFORMING ORGANIZATION REPORT NUMBER(S)			5. MONITORING ORGANIZATION REPORT NUMBER(S) <b>AFOSR-TR- 88-1324</b>		
6a. NAME OF PERFORMING ORGANIZATION University of Toronto Institute for Aerospace Studies		6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION <b>AFOSR</b>		
6c. ADDRESS (City, State, and ZIP Code) 4925 Dufferin St., Downsview, Ontario, Canada, M3H 5T6			7b. ADDRESS (City, State, and ZIP Code) <b>Bolling AFB</b> <b>Washington D.C. 20332</b>		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION Air Force Office of Scientific Research/NA		8b. OFFICE SYMBOL (If applicable) <b>NA</b>	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER <b>AF-AFOSR-87-0124</b>		
8c. ADDRESS (City, State, and ZIP Code) Bldg. 410, Bolling Air Force Base, DC 20332			10. SOURCE OF FUNDING NUMBERS		
			PROGRAM ELEMENT NO. <b>61102F</b>	PROJECT NO. <b>2307</b>	TASK NO. <b>A1</b>
11. TITLE (Include Security Classification) FINAL REPORT, "ANALYTICAL, NUMERICAL AND EXPERIMENTAL INVESTIGATIONS OF OBLIQUE-SHOCK-WAVE REFLECTIONS IN PURE AND DUSTY GASES". UNCLASSIFIED					
12. PERSONAL AUTHOR(S) Dr. I. I. Glass					
13a. TYPE OF REPORT Final		13b. TIME COVERED FROM Feb. 1/87 to Sep. 30/88		14. DATE OF REPORT (Year, Month, Day) October, 1988	
15. PAGE COUNT <b>75</b>					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	1. Pseudostationary, oblique shock wave reflections		
	<b>20.04</b>		2. Interferometry, 3. Numerical analysis, 4. Dusty gas shock tube flows. (Angeles) ←		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
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Continued... →					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION Unclassified		
22a. NAME OF RESPONSIBLE INDIVIDUAL <b>DR L SAKELL</b>			22b. TELEPHONE (Include Area Code) <b>202-767-4935</b> 22c. OFFICE SYMBOL <b>AFOSR/IN/A</b>		

DD FORM 1473, 84 MAR

83 APR edition may be used until exhausted.

All other editions are obsolete.

SECURITY CLASSIFICATION OF THIS PAGE

UNCLASSIFIED  
UNCLAS-1P.

## 19. Abstract - Continued

Problem 3 - An Interferometric Investigation of the Diffraction of Planar Shock Waves Over a Half-Diamond Cylinder in Air. This problem has been completed and resulted in the presentation of the paper with the same title by D. L. Zhang and I. I. Glass, which was presented at the 8th International Mach Reflection Symposium, held at UTIAS, during July 12-15, 1988.

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Problem 5 Normal Shock-Wave Structure in a Dusty-Air Shock-Tube. Mr. G. D. Lock is completing a Ph.D. thesis. His data appear very good indeed. He is expected to complete his research program in 1989, under the direction of Dr. J. J. Gottlieb.

Problem 6 The Pitot Tube in a Dusty-Air Shock-Tube. This project is part of the Ph.D. thesis by G. D. Lock. Very successful dusty-air data have been obtained already.

Problem 7 Laminar Sidewall Boundary Layer Induced by a Moving Shock Wave in a Dusty-Air Shock-Tube. This research was completed and appeared as UTIAS Report No. 312 by B. Y. Wang and I. I. Glass under the same title, approximately.

Problem 8 Flat Plate Boundary Layer Induced by a Moving Shock Wave in a Dusty-Air Shock-Tube. This work was completed and appeared as UTIAS Report Nos. 310 and 311 by B. Y. Wang and I. I. Glass under Asymptotic Solutions and Finite-Difference Solutions, respectively.

*Keywords:*



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DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
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### Problem 1

An Interferometric Investigation of Terminal Double Mach Reflections in low- $\gamma$  Gases - isobutane ( $C_4H_{10}$ ) and sulfurhexafluoride ( $SF_6$ ). This problem has been completed and resulted in the presentation of the paper, "A Resolution of the von Neumann Paradox", by J. T. Urbanowicz and I. I. Glass at the 8th International Mach Reflection Symposium, held at UTIAS, during 12-15 July, 1988.

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#### Problem 8

Flat Plate Boundary Layer Induced by a Moving Shock Wave in a Dusty-Air Shock-Tube. This work was completed and appeared as UTIAS Report Nos. 310 and 311 by B. Y. Wang and I. I. Glass under Asymptotic Solutions and Finite-Difference Solutions, respectively.

#### Additional List of Publications

The following publications are in addition to those reported in detail in AFOSR Final Report on Grant AFOSR-82-0096 for the five-year period 1 February, 1982 - 31 January, 1987.

1. B. Y. Wang and I. I. Glass, "Compressible Laminar Boundary-Layer Flows of a Dusty Gas Over a Semi-Infinite Flat Plate", J. Fluid Mech., Vol. 186, pp. 223-241, 1988.
2. I. I. Glass, "The Shock Tube and Its Applications", Experiments in Fluid Mechanics, Sec. 16, Supersonic Flow, pp. 380-386, Robert A. Granger, Ed.

4. I. I. Glass and J. Kleiman, "Some PCH Aspects of Shock-Wave Research", PCH PhysicoChemical Hydrodynamics, Vol. 9, No. 1/2, pp. 93-99, 1987.
5. D. L. Zhang and I. I. Glass, "An Interferometric Investigation of the Diffraction of Planar Shock Waves over a Half-Diamond Cylinder in Air", UTIAS Report No. 322, March 1988.
6. J. T. Urbanowicz, "Pseudo-Stationary Oblique-Shock-Wave Reflections in Low Gamma Gases - Isobutane and Sulphur Hexafluoride", UTIAS Tech. Note No. 267, Feb. 1988.
7. J. Kaca, "An Interferometric Investigation of the Diffraction of a Planar Shock Wave Over a Semicircular Cylinder", UTIAS Tech. Note No. 269, to be published.
8. H. Honma and I. I. Glass, "Nonlinear Effects on Weak Spherical N-Waves in Air with Vibrational Excitation", Proc. R. Soc. Lond. (to be published).

Our contributions to shock-wave phenomena over the past 40 years have been numerous in the open literature and in UTIAS Reports, Technical Notes and Reviews. This has been recognized in many countries especially the USA, when I was the AIAA Dryden Lecturer for 1986, and more recently in Canada, when I was presented with a testimonial by the 8th International Mach Reflection Symposium held at UTIAS, 12-15 July, 1988, which reads as follows, "A tribute to Professor I. I. Glass for his seminal contributions to theory and experiments revealing the complex nature of Oblique Shock Wave Reflection Phenomena". Brief assessments of his contributions were given by Dr. George Ullrich, DNA, Washington, and by Dr. H. Reichenbach, Ernst Mach Institute, Freiburg, West Germany. Prof. Glass told the audience that for health reasons he will now retire at 70 (Feb. 1988) and he and his wife Freda will spend 6 months (Nov.-May) in Florida and

6 months (May-Nov.) at UTIAS. Consequently, he will still be available for consultation and advice in the future.

Finally, I wish to thank DNA for their generous financial support over the few years in our research and development work. It was crucial and consequently, enabled us to be productive and inventive. Due credit was always given to DNA for this support in our publications.

*I. I. Glass*  
I. I. Glass